* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the electrode formation equipment which an electrode is formed, for example, is used for a substrate at the electrode formation approach of electronic parts, such as a radiator and a resonator, and it especially about the electrode formation equipment used for the electrode formation approach of electronic parts, and it.
[0002]
[Description of the Prior Art] Drawing 9 is the top view showing an example of the conventional mask for vacuum evaporationo used as the background of this invention. This mask 1 for vacuum evaporationo contains the rectangular metal plate 2. Two or more openings 3 are formed in the metal plate 2 at the position. These openings 3, ..., 3 are divided by two or more batch section 1b which has a function as the 1st masking section, and those partition section 1b is connected to periphery 1a which has a function as the 2nd masking section.
[0003] Since the width of face is thin, batch section 1b which divides opening 3 with such a mask 1 for vacuum evaporationo has the small heat release by heat conduction at the time of vacuum evaporationo. Moreover, since periphery 1a becomes an attaching part for carrying this mask 1 for vacuum evaporationo, heat is usually emitted from a part for that attaching part. Therefore, the temperature of batch section 1b becomes higher than the temperature of periphery 1a, and the amount of thermal expansion of batch section 1b becomes larger than the amount of thermal expansion of periphery 1a. And since the rigidity of batch section 1b is smaller than the rigidity of periphery 1a, batch section 1b carries out heat deformation, and a clearance produces it between batch section 1b and the work piece formed as a substrate. Therefore, the electrode material used as an electrode layer enters the clearance. In this case, a defect part and an electrode pattern (common name: dotage) poor [so-called] will be generated to some electrode patterns.
[0004] Then, as it is shown in drawing 10 if it puts in another way in order to ease this poor electrode pattern in order to ease heat deformation of batch section 1b resulting from the temperature gradient of batch section 1b and its periphery 1a for example, the mask 1 for vacuum evaporationo which formed infeed 4 in the perimeter of periphery 1a is proposed. This mask for vacuum evaporationo serves as a background of this invention, and is indicated by JP,61-130480,A. This mask 1 for vacuum evaporationo is formed in ** to which two or more infeeds 4 reach [from opening 3] the edge of the metal plate 2, and meet especially the straight line of the metal plate 2 which passes along a core mostly compared with the conventional example of drawing 9 . With the mask 1 for vacuum evaporationo shown in drawing 10 , since the difference of the amount of thermal expansion of batch section 1b and periphery 1a is absorbed by infeed 4 at the time of vacuum evaporationo, compared with the mask 1 for vacuum evaporationo shown in drawing 9 , a poor electrode pattern can be made to some extent small.
[0005] Drawing 11 and drawing 12 are the top views showing an example of the conventional sputtering mask which is indicated by JP,63-73350,U and serves as a background of this invention further. The sputtering mask 1 of drawing 12 contains the rectangle frame-like mask frame 5. In the center of the

mask frame 5, the mask section 6 of a circle configuration which has the spatter holes 6a, ..., 6a of two or more rectangles is arranged. The mask section 6 is supported by the support sections 7a, 7b, 7c, and 7d which are prolonged to the mask section 6 from an each sides [of the mask frame 5 / 5a, 5b, 5c, and 5d] center, and are connected with the mask section 6. It becomes the support sections 7a-7d from the notch of the shape for example, of a semicircle, and misses in them, and Slots 8a-8d are formed in them. Moreover, it supports in the mask frame 5 with each sides 5a-5d of the mask frame 5, and four dummy holes 9 are formed in it according to a collaboration operation with Sections 7a-7d and the mask section 6. On the other hand, the support sections 7e, 7f, 7g, and 7h which the mask section 6 is formed in the shape of a rectangle compared with the sputtering mask 1 of drawing 11 , miss the sputtering mask 1 of drawing 12 in the support section which supports the mask section 6 especially, and have not formed Slots 8a-8d are arranged further. With the sputtering mask 1 shown in drawing 11 and drawing 12 , since the expansion force can be missed and it can absorb by Slots 8a-8d when the mask section 6 carries out thermal expansion and spreads at the time of sputtering, a poor electrode pattern can be made small.

[0006]

[Problem(s) to be Solved by the Invention] However, with the structure of the mask 1 for vacuum evaporationo of drawing 10 currently indicated by JP,61-130480,A, since an electrode material enters also into infeed 4 part at the time of vacuum evaporationo, the electrode pattern for which it asks cannot be obtained correctly. Moreover, since the configuration of opening 3 deforms in connection with deformation of the metal plate 2 as the two-dot chain line of drawing 10 shows when the compressive stress by the thermal expansion at the time of vacuum evaporationo is large, this and the electrode pattern for which it asks cannot be obtained correctly.

[0007] On the other hand, with the sputtering mask 1 of drawing 11 currently indicated by JP,63-73350,U, since it misses in the narrow support sections 7a-7d of the width method which supports the mask section 6 and Slots 8a-8d are formed, the mechanical strength of the support sections 7a-7d, as a result the mask section 6 becomes weak, and there is a possibility that the mask section 6 cannot be supported correctly. Furthermore, the handling by the mask itself will also become difficult.

[0008] Moreover, with the sputtering mask 1 of drawing 12 , since there are the support sections 7e-7h which miss and do not have a slot, the effectiveness of absorbing the compressive stress by the thermal expansion at the time of sputtering cannot be attained. Therefore, the electrode pattern which asks also for the sputtering mask 1 of drawing 12 currently indicated by JP,63-73350,U cannot be obtained correctly.

[0009] So, it is offering the electrode formation equipment which the main purpose of this invention uses for the electrode formation approach of electronic parts with few falls on the strength, and it there being very few poor electrode patterns resulting from heat deformation.

[0010]

[Means for Solving the Problem] The process for which invention according to claim 1 is the electrode formation approach of electronic parts of making the ingredient used as an electrode adhering to a work piece using a mask, and a work piece is prepared, The process which arranges a mask on the principal plane of a work piece, and the process which gives the electrode material which serves as an electrode from the principal plane side of a mask are included. A mask Two or more membrane formation holes arranged in order to make an ingredient adhere to a work piece, and the masking section which contacts the predetermined part of a work piece and covers the predetermined part of said work piece, It is the electrode formation approach of electronic parts which both ends are fixed and arranged so that between ****** membrane formation holes may be straddled near the membrane formation hole, and contains the flexible section of the shape of a beam encastre which absorbs heat deformation of the masking section. Invention according to claim 2 is the electrode formation approach of electronic parts according to claim 1 constituted when the flexible section prepares an outlet port near the membrane formation hole. Invention according to claim 3 is the electrode formation approach of electronic parts according to claim 1 constituted when the flexible section prepares a notch near the membrane formation hole. Invention according to claim 4 is the electrode formation approach of electronic parts according to claim

1 to 3 that the flexible section is arranged by the symmetry to the center line of the masking section between ****** membrane formation holes. As for invention according to claim 5, the flexible section is arranged at the both sides of the masking section. The overall length of C (mm) and the masking section for the width of face of A (mm) and the flexible section 2L (mm), [the die length of the flexible section] If the coefficient of thermal expansion of the ingredient of h (mm) and a mask is set [the width of face of the masking section / the temperature gradient of the maximum temperature of 2B (mm) and the masking section, and the temperature of the periphery of the masking section] to alpha (1-/degree C) for the thickness of deltaT (degree C) and a mask,

$$3 \geqq \frac{12L^3C^3\alpha\Delta T}{\pi^2 h^2 \{LC^3(1+\alpha\Delta T)+A^3B\}}$$

It is the electrode formation approach of electronic parts according to claim 1 to 4 to satisfy. As for invention according to claim 6, the flexible section is arranged at one end of the masking section. The overall length of C (mm) and the masking section for the width of face of A (mm) and the flexible section 2L (mm), [the die length of the flexible section] If the coefficient of thermal expansion of the ingredient of h (mm) and a mask is set [the width of face of the masking section / the temperature gradient of the maximum temperature of 2B (mm) and the masking section, and the temperature around the masking section] to alpha (1-/degree C) for the thickness of deltaT (degree C) and a mask,

$$3 \geqq \frac{24L^3C^3\alpha\Delta T}{\pi^2 h^2 \{2LC^3(1+\alpha\Delta T)+A^3B\}}$$

It is the electrode formation approach of electronic parts according to claim 1 to 4 to satisfy. Invention according to claim 7 is electrode formation equipment of the electronic parts which make the ingredient used as an electrode adhere to a work piece using a mask. A mask Two or more membrane formation holes arranged in order to make an ingredient adhere to a work piece, and the masking section which contacts the predetermined part of a work piece and covers the predetermined part of said work piece, It is electrode formation equipment of electronic parts which both ends are fixed and arranged so that between ****** membrane formation holes may be straddled near the membrane formation hole, and contains the flexible section of the shape of a beam encastre which absorbs heat deformation of the masking section. Invention according to claim 8 is electrode formation equipment of electronic parts according to claim 7 constituted when the flexible section prepares an outlet port near the membrane formation hole. Invention according to claim 9 is electrode formation equipment of electronic parts according to claim 7 constituted when the flexible section prepares a notch near the membrane formation hole. Invention according to claim 10 is electrode formation equipment of electronic parts according to claim 7 to 9 with which the flexible section is arranged by the symmetry to the center line of the masking section between ****** membrane formation holes. As for invention according to claim 11, the flexible section is arranged at the both sides of the masking section. The overall length of C (mm) and the masking section for the width of face of A (mm) and the flexible section 2L (mm), [the die length of the flexible section] If the coefficient of thermal expansion of the ingredient of h (mm) and a mask is set [the width of face of the masking section / the temperature gradient of the maximum temperature of 2B (mm) and the masking section, and the temperature of the periphery of the masking section] to alpha (1-/degree C) for the thickness of deltaT (degree C) and a mask,

$$3 \geqq \frac{12L^3C^3\alpha\Delta T}{\pi^2 h^2 \{LC^3(1+\alpha\Delta T)+A^3B\}}$$

It is electrode formation equipment of electronic parts according to claim 7 to 10 to satisfy. As for invention according to claim 12, the flexible section is arranged at one side of the masking section. The

overall length of C (mm) and the masking section for the width of face of A (mm) and the flexible section 2L (mm), [the die length of the flexible section] If the coefficient of thermal expansion of the ingredient of h (mm) and a mask is set [the width of face of the masking section / the temperature gradient of the maximum temperature of 2B (mm) and the masking section, and the temperature of the periphery of the masking section] to alpha (1-/degree C) for the thickness of deltaT (degree C) and a mask,

$$3 \geq \frac{24L^3C^3\alpha\Delta T}{\pi^2 h^2 \{2LC^3(1+\alpha\Delta T)+A^3B\}}$$

It is electrode formation equipment of electronic parts according to claim 7 to 10 to satisfy.
[0011]
[Function] In invention according to claim 1 to 12, the heat deformation produced with the thermal stress of masking circles resulting from the temperature gradient of the masking section and its periphery, i.e., the compressive stress by thermal expansion being restrained, is absorbed and eased, when the flexible section bends. Especially, in claim 2 and invention according to claim 8, when the flexible section bends in the direction of a recess hole, heat deformation of the masking section is absorbed. Moreover, in claim 3 and invention according to claim 9, when the flexible section bends in the direction of a notch, heat deformation of the masking section is absorbed. Moreover, in claim 5 and invention according to claim 11, the flexible section is arranged at the both sides of the masking section, and heat deformation of the masking section becomes still better by satisfying the formula shown by claim 5 and claim 11. Furthermore, in claim 6 and invention according to claim 12, the flexible section is arranged at one side of the masking section, and heat deformation of the masking section becomes still better by satisfying the formula shown by claim 6 and claim 12.
[0012]
[Effect of the Invention] According to invention according to claim 1 to 12, the buckling which is deformation of a direction perpendicular to the work-piece principal plane of the masking section is eased according to the above-mentioned operation, and adhesion with the predetermined part of the work piece covered by the masking section and the masking section is not spoiled. Therefore, an exact electrode pattern without a blot can be formed in the edge of an electrode pattern at a work piece. Furthermore, according to invention according to claim 1 to 12, as shown in the conventional example, the reinforcement of the mask itself does not become extremely low. That is, according to this invention, the electrode formation equipment which the poor electrode pattern resulting from heat deformation uses for the electrode formation approach of electronic parts with few falls on the strength and it very few is obtained.
[0013] The above-mentioned purpose of this invention, the other purposes, the description, and an advantage will become still clearer from detailed explanation of the gestalt of implementation of the following invention performed with reference to a drawing.
[0014]
[Embodiment of the Invention]
[Example] Drawing 1 is the perspective view showing one example of this invention, drawing 2 is that decomposition perspective view, and drawing 3 is a notching **** important section top view about that part. Explanation of this example explains the electrode formation equipment of the electronic parts of this invention first. The electrode formation equipment 10 of these electronic parts contains the rectangle tabular work holder 12. A work holder 12 has two or more rectangular maintenance holes 14, 14, ..., 14. These maintenance holes 14 are for holding work pieces W, W, ..., W, and are penetrated and established in an another side principal plane from the one side principal plane of a work holder 12. Although two or more maintenance holes 14 separate predetermined spacing in all directions [of a work holder 12] and are established in it, in drawing 1 and drawing 2 , illustration of two or more maintenance holes 14, ..., 14 arranged in pars intermedia is omitting them.
[0015] The rectangle tabular membrane formation pattern masks 16 and 18 are arranged in an one side

principal plane [of a work holder 12], and another side principal plane side as a mask, respectively. Since the membrane formation patterns 16 and 18 have the same structure, one membrane formation pattern mask 16 is explained. The membrane formation pattern mask 16 has two or more rectangular membrane formation holes 20, 20, ..., 20. These membrane formation holes 20 are for on the other hand forming the predetermined membrane formation pattern of work pieces W, W, ..., W in a principal plane, and are penetrated and prepared in an another side principal plane from the one side principal plane of the membrane formation pattern mask 16. In this example, 1 set of two membrane formation holes 20 and 20 arranged lining up side-by-side, for example are extended and formed in the die-length direction of the membrane formation pattern mask 16. 1 set of two membrane formation holes 20 and 20 separate predetermined spacing in all directions [of the membrane formation pattern mask 16], and are prepared in it two or more sets. Although two or more membrane formation holes 20 separate predetermined spacing in all directions [of the membrane formation pattern mask 16] and are prepared in it, in drawing 1 and drawing 2 , illustration of two or more membrane formation holes 20, ..., 20 arranged in pars intermedia is omitting them.

[0016] As shown in the membrane formation pattern mask 16 at drawing 3 and drawing 4 , the 1st masking section 22 and the 2nd masking section 24 are formed in the perimeter of two or more membrane formation holes 20 and 20. In this case, the 1st masking section 22 is formed in one end and lateral stable ranking and hierarchy of the membrane formation holes 20 and 20 of the membrane formation hole 20 between the ends of the longitudinal direction of the membrane formation hole 20 of ****** another side. [of each class] Moreover, the 2nd masking section 24 is formed in one end and vertical list of the die-length direction of the membrane formation holes 20 and 20 of the membrane formation hole 20 between the ends of the die-length direction of the membrane formation hole 20 of ****** another side. [of each class]

[0017] It is constituted as the masking section in which the 1st masking section 22 has the masking function of Maine, and consists of this example as the masking section in which the 2nd masking section 24 has a factice's masking function.

[0018] Furthermore, it is near the 1st masking section 22, and 1 set of 1st outlet ports 26 and 26 are partially arranged in an end [of the die-length direction of the 1st masking section 22], and other end side by the membrane formation pattern mask 16 in this case, respectively. On the other hand, the 1st outlet port 26 and 26 of another side is arranged so that between the membrane formation hole 20 lining up side-by-side and 20 may be straddled, respectively. In this example, as especially shown, for example in drawing 4 , the overall length of the 1st masking 22 is formed in 2L (mm), and that width of face is formed in 2B (mm). Moreover, from the 1st lateral end and lateral other end of the masking section 22, only the distance of A (mm) is prolonged in the longitudinal direction of the membrane formation holes 20 and 20, and outlet ports 26 and 26 project it, and are prepared, respectively. In addition, in this example, thickness [of the 1st masking section 22] h (mm) is formed similarly to the thickness of the membrane formation pattern masks 16 and 18, and the direction of overall-length 2L (mm) and width-of-face 2B (mm) of the 1st masking section 22 is greatly formed to that thickness h (mm).

[0019] In this example, since the 1st outlet port 26 and 26 is established in the both sides of the die-length direction of the 1st masking 22, between the outlet port 26 of both sides, and the 1st masking section 22, the so-called flexible sections 30 and 30 of the shape of a beam encastre to which those both ends of a long and slender rectangle are being fixed are formed. In this case, if the part in which only the distance of A (mm) was prolonged in the longitudinal direction of the membrane formation holes 20 and 20, and was projected and prepared in it from the 1st lateral end and lateral other end of the masking section 22 is made into the die length of the flexible sections 30 and 30, respectively, the die length of the flexible sections 30 and 30 will be formed in A (mm), and the width of face of the flexible sections 30 and 30 will be formed in C (mm). Moreover, the overall length of outlet ports 26 and 26 is formed in [a+b (mm)]. In this example, when distance from the end and the other end of X and the die-length direction of the 1st outlet port 26 and 26 to a medial axis X is set to a (mm) and b (mm) for the medial axis of the 1st masking section 22, respectively, it is formed in a=b. If this is put in another way, as for the flexible sections 30 and 30, the die length is formed equally [right and left] focusing on the medial

axis X. That is, it is arranged by the symmetry to the center line of the cross direction of the ****** membrane formation hole 20 and the 1st masking section 22 between 20.
[0020] Furthermore, it is near the 2nd masking section 24, and 1 set of 2nd outlet ports 28 and 28 are partially arranged in an end [of the die-length direction of the 2nd masking section 24], and other end side by the membrane formation pattern mask 16 in this case, respectively. On the other hand, the 2nd outlet port 28 and 28 of another side is arranged, respectively so that between the membrane formation hole 20 of a vertical list and 20 may be straddled.
[0021] Similarly, the membrane formation pattern mask 18 is arranged in the another side principal plane side of a work holder 12. In addition, in this example, a work holder 12 and the membrane formation pattern masks 16 and 18 are formed in the almost same magnitude, and tooling holes (not shown) are prepared in the location which corresponds mutually, respectively.
[0022] A work holder 12 is in the condition pinched between two membrane formation pattern masks 16 and 18, and the mask electrode holder (not shown) which has a gage pin is equipped with it. In this case, one by one, the membrane formation pattern mask 18, a work holder 12, and the membrane formation pattern mask 16 are inserted in the gage pin of a mask electrode holder (not shown), and a mask electrode holder (not shown) is equipped with them.
[0023] Next, the electrode formation approach of the electronic parts using the electrode formation equipment 10 of the electronic parts containing the above-mentioned work holder 12 and the membrane formation pattern masks 16 and 18 is explained. First, two or more rectangle tabular work pieces W used as a substrate are prepared. Electrostrictive ceramics etc. is used for these work pieces W. Moreover, a work holder 12 and the membrane formation pattern masks 16 and 18 are prepared.
[0024] And two or more work pieces W are inserted in the maintenance hole 14 of a work holder 12, and are held. Moreover, the membrane formation pattern masks 16 and 18 are arranged at a front-face [of a work holder 12], and rear-face side. Furthermore, where the work holder 12 which held the work piece W between the membrane formation pattern mask 16 and 18 is pinched, a mask electrode holder (not shown) is equipped with those members 16, 12, and 18. A work piece W is positioned by it at a position.
[0025] And it is in the condition which set a work holder 12 and the membrane formation pattern masks 16 and 18 to the mask electrode holder (not shown), for example, membrane formation processing is performed to the front face and rear face of a work piece W by sputtering, vacuum evaporationo, and the other membrane formation approaches. Therefore, in the front face and rear face of a work piece W, an electrode material adheres to the part exposed through the membrane formation hole 20 of the membrane formation pattern masks 16 and 18, respectively. Moreover, since the electrode garbage of the front face of a work piece W and a rear face is covered by the part 22 except the membrane formation hole 20 of the membrane formation pattern masks 16 and 18, i.e., the 1st masking section, and the 2nd masking section 24, an electrode material does not adhere. Therefore, the desired membrane formation pattern used as an electrode is formed in the front face and rear face of a work piece W, respectively.
[0026] Especially in this example, by arranging outlet ports 26 and 26 in the both sides of the die-length direction of the 1st masking section 22 of the membrane formation pattern masks 16 and 18 Since the so-called flexible sections 30 and 30 of the shape of a beam encastre which the both ends are fixed to the both sides of the die-length direction of the 1st masking section 22, and serves as the fixed end are formed Heat deformation of the thermal stress 22 in the 1st masking section 22 generated at the time of membrane formation processing, i.e., the 1st masking section resulting from the temperature gradient of the 1st masking section 22 and periphery, can be absorbed by the flexible sections 30 and 30, and it can ease. In this case, as the 1st masking section 22 is connected to that periphery 24, i.e., the 2nd masking section, through the flexible sections 30 and 30, for example, it is shown in drawing 5 , when the flexible sections 30 and 30 bend in an outlet port 26 and the 26 directions, the relaxation effect that heat deformation of the 1st masking section 22 can be absorbed, and it can ease is obtained.
[0027] When the artificer of the invention in this application examines an above-mentioned relaxation effect wholeheartedly, then, by the theoretical formula and the FEM simulation The relation with the

compressive stress sigma (kgf/mm2) which remains without the ability easing in parameters, such as a configuration of the flexible sections 30 and 30, and an ingredient, and the 1st masking section 22 As shown in drawing 4 , by for example, the case where the flexible beam-encastre-like sections 30 and 30 are arranged in the both sides of the die-length direction of the 1st masking section 22 The width of face of A (mm) and the masking section 22 of the above 1st for the die length of the above-mentioned flexible sections 30 and 30 2B (mm), The die length of C (mm) and the masking section 22 of the above 1st for the width of face of the above-mentioned flexible sections 30 and 30 2L (mm), The temperature gradient of the maximum temperature of the masking section 22 of the above 1st, and the temperature of the periphery of the masking section 22 of the above 1st deltaT (degree C), It turned out that the thickness of the masking section 22 of the above 1st can be expressed in general with the following [formula 1] if the modulus of direct elasticity of alpha (1-/degree C) and the masking section 22 of the above 1st is set to E (kgf/mm2) for the coefficient of thermal expansion of the ingredient of h (mm) and the masking section 22 of the above 1st.

[0028]

$$\sigma = \frac{E L C^3 \alpha \Delta T}{L C^3 (1 + \alpha \Delta T) + A^3 B} \cdots \text{〔式1〕}$$

[0029] On the other hand, if the configuration of the 1st masking section 22 is regarded as a long column with a rectangular cross section, compressive-stress sigmak (kgf/mm2) from which this 1st masking section 22 starts a buckling, and begins to produce deformation will become the following [formula 2] from Euler's equation. However, the both ends of the die-length direction of the 1st masking section 22 are assumed to be the fixed end in this case.

[0030]

$$\sigma_k = \frac{\pi^2 E h^2}{12 L^2} \cdots \text{〔式2〕}$$

[0031] A ratio [the artificer of the invention in this application / sigma/sigmak] with compressive-stress sigmak (kgf/mm2) from which the compressive stress sigma (kgf/mm2) and the 1st masking section 22 which remain without the ability easing in the 1st masking section 22 start a buckling, and begin to produce deformation, i.e., it is, It was assumed that the existence of a poor electrode pattern (common name: dotage) was determined. Namely, sigma/sigmak It was assumed that it became the following [formula 3].

[0032]

$$\frac{\sigma}{\sigma_k} = \frac{12 L^3 C^3 \alpha \Delta T}{\pi^2 h^2 \{L C^3 (1 + \alpha \Delta T) + A^3 B\}} \cdots \text{〔式3〕}$$

[0033] Then, sigma/sigmak The relation between a ratio and the existence of a poor electrode pattern (common name: dotage) was investigated by the following examples of an experiment.

[Example of an experiment] In this example of an experiment, consider as the thickness h= 0.3 (mm) of the membrane formation pattern mask 16 (18), and it sets to drawing 4 further. It considered as L= 14.7 (mm), C= 0.3 (mm), alpha= 18x10-6 (1-/degree C) (ingredient: 304 about SUS), and deltaT=180 degree C (fruit side value), and further, the dimension of A and B was set up suitably and the membrane formation pattern mask was made as an experiment. And membrane formation processing was performed to the work piece W using the membrane formation pattern mask. The experimental result is shown in the graph of drawing 6 . The continuous line and broken line in drawing 6 express the count result of the above [a formula 3] by making die-length [of the above-mentioned flexible sections 30 and 30] A (mm) into a parameter. In this case, it is shown that the poor electrode pattern (common name:

dotage) generated the plotting point of NG-data, and the plotting point of G-data shows that a poor electrode pattern (common name: dotage) is not generated.
[0034] It is 3.0>=sigma/sigmak so that clearly from the experimental result of drawing 6 . When relation was satisfied, it was proved that a poor electrode pattern (common name: dotage) was not generated. In this case, if the configuration and ingredient of the membrane formation pattern masks 16 and 18 which have the 1st masking section 22, outlet ports 26 and 26, and flexible branches 30 and 30 are designed so that the value of the above [a formula 3] may become 3.0 or less, the poor electrode pattern at the time of membrane formation processing (common name: dotage) can be prevented. That is, if the membrane formation pattern mask with which are satisfied of the above [a formula 3] is used, when the flexible sections 30 and 30 bend in an outlet port 26 and the 26 directions, heat deformation of the 1st masking branch 22 resulting from the temperature gradient of the 1st masking section 22 and the periphery at the time of membrane formation processing absorbs heat deformation of the 1st masking section 22, and can be eased.
[0035] Therefore, in this example, it can prevent the part except the membrane formation hole 20 of a work piece W and the membrane formation pattern masks 16 and 18, and that a clearance occurs between the 1st masking section 22 especially. Therefore, in this example, the poor electrode pattern (common name: dotage) produced when an electrode material enters between a work piece W and said clearance can be prevented. That is, in the above-mentioned example, an electrode pattern can be correctly formed in a work piece W, and a pattern edge also becomes clear. So, if the substrate which has the electrode formed by the electrode formation approach using the electrode formation equipment of this example is used, electrical characteristics are stable and can produce the electronic parts which were rich in dependability.
[0036] Although the flexible sections 30 and 30 were arranged in the both sides of the die-length direction of the 1st masking section 22 in the above-mentioned example, when the flexible section 30 is arranged only in one side of the die-length direction of the 1st masking section 22, 2L, then since it is good, it is sigma/sigmak about L of the above [a formula 1]. It is assumed that it becomes the following [formula 4].
[0037]

$$\frac{\sigma}{\sigma_k} = \frac{24L^3C^3\alpha\Delta T}{\pi^2 h^2 \{2LC^3(1+\alpha\Delta T)+A^3B\}} \cdots \text{〔式4〕}$$

[0038] Also in this case, it is 3.0>=sigma/sigmak, in order to absorb heat deformation of the 1st masking section 22 and to ease. It is desirable to satisfy relation.
[0039] Drawing 7 is the important section top view showing other examples of this invention. This example does not have the especially uniform width of face of the 1st masking section compared with the example shown in drawing 1 - drawing 4 , etc. That is, in the example shown in drawing 7 , compared with the 1st masking branch 22 shown in drawing 4 etc., the rectangular lobes 34 and 34 are formed in the pars intermedia of the die-length direction of the 1st masking section 32, and the width method of the 1st masking section 32 is not fixed. In this case, what is necessary is to perform stress count of the above [a formula 3] and just to design a membrane formation pattern mask safely more by setting the dimension of the smallest part of the width of face of the 1st masking section 32 as width-of-face 2B (mm) of the masking section.
[0040] Drawing 8 is the important section top view showing the example of further others of this invention. Compared with the example shown in drawing 1 - drawing 4 , etc., especially, two or more 1st masking sections adjoin, and this example is formed. That is, in the example shown in drawing 8 , the 1st two masking section 36a and 36b is adjoined and arranged in the longitudinal direction through other 1st outlet port 38 [the 1st masking branch 22 arranged by independent / which is shown in drawing 4 etc.]. Therefore, in the example shown in drawing 8 , the independent flexible section 30 cannot be formed in the both sides of the die-length direction of the 1st two masking section 36a and

36b, respectively. Therefore, in the example shown in drawing 8 , it has composition which shares the one flexible section 30 in the both sides of the die-length direction of the 1st two masking section 36a and 36b, respectively. In this case, the dimension (mm) of the masking width of face of the 1st masking section 36a and 36b is 2B-2B0. It is set up by carrying out and stress count of the above [a formula 3] is performed. In addition, what is necessary is just to design a membrane formation pattern mask in the example shown in drawing 8 , by setting up the width method of the masking section by the same approach, and performing stress count of the above [a formula 3], even when formed or more in three, for example although the masking section was formed in the 1st two masking section 36a and 36b.
[0041] In addition, although the flexible section was formed by arranging an outlet port near the membrane formation hole in each above-mentioned example For example, it changes into the 1st outlet port 26 and 2nd outlet port 28 of drawing 3 and drawing 4 . For example, you may make it form the flexible section, respectively by applying near the membrane formation holes 20 and 20 from the end of the die-length direction of the membrane formation pattern mask 16 (18), and the cross direction, and arranging a notch. Moreover, although the membrane formation hole 20 prepared in the membrane formation pattern masks 16 and 18 was formed in the rectangle in each above-mentioned example, it is mere instantiation and the configuration of a membrane formation hole may be changed into other configurations at arbitration according to the configuration of the electrode pattern for which it asks. Moreover, according to the configuration of a work piece W, the configuration of a work holder 12 can also be changed suitably.

[Translation done.]